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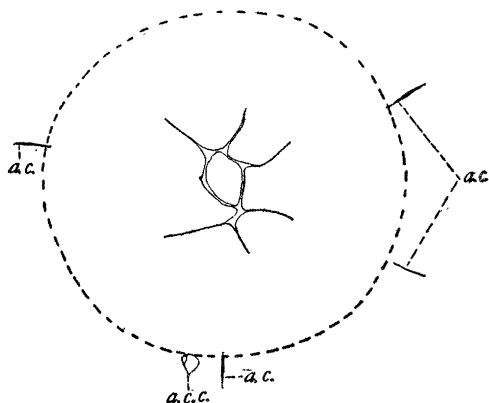
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The earliest stage at which I have observed the accessory cleavage is the four-cell. It takes place outside of the area occupied by the primary cleavage, and the planes of the furrows usually coincide with radii of the disc.



Eight-cell stage of the hen's egg. The egg was taken about twenty hours before the time of laying. *a. c.*, accessory cleavage furrows; *a. c. c.*, a small accessory cleavage cell. The dotted line represents the limit of the area of primary cleavage.

The number of accessory cleavages is at no time great. The greatest number so far observed is shown in the accompanying sketch. The actual number, however, may be slightly greater than is indicated by surface views, because in the sections of at least one egg, I have found that not all of the cleavages come to the surface, but some occur in a horizontal plane. That these cleavages are accessory is evidenced by the fact that their accompanying nuclei greatly simulate the supernumerary sperm-nuclei figured by Harper for the pigeon.

Shortly after the stage figured above the accessory cleavages disappear. A detailed study of sections will have to determine whether their disappearance is to be correlated with the degeneration of the supernumerary sperm-nuclei, as reported for the pigeon.

In conclusion it may be said that polyspermy, accompanied by accessory cleavage, normally occurs in the hen's egg. If the number of accessory cleavage furrows may be taken as a general index to the number of accessory sperms entering the egg, it is evident

that polyspermy in the hen is not nearly so great as in the pigeon.

J. THOS. PATTERSON

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#### THE AMERICAN PHILOSOPHICAL SOCIETY

THE general meeting of the American Philosophical Society was held at the hall of the society on Independence Square, Philadelphia, on April 22, 23 and 24. The opening session began at two o'clock on Thursday, April 22, with President Keen in the chair, and morning and afternoon sessions were held on Friday and Saturday. Vice-president Michelson was in the chair during the session devoted to the papers in physics and Vice-president Scott at that at which the geological papers were considered. The evening of Friday, April 23, was devoted to a Darwin celebration commemorative of the centenary of Charles Darwin's birth and of the fiftieth anniversary of the publication of the "*Origin of Species*," at which addresses made by the Right Honorable James Bryce, the British Ambassador, on "*Personal Reminiscences of Charles Darwin and of the Reception of the 'Origin of Species'*"; by Professor George Lincoln Goodale, of Harvard, on "*The Influence of Darwin on Natural Science*," and by Professor George Stuart Fullerton, of Columbia, on "*The Influence of Darwin on the Mental and Moral Sciences*."

On Saturday afternoon there was a symposium on earthquakes at which papers were presented by Professor Edmund O. Hovey, Professor William H. Hobbs and by Professor Harry F. Reid. Aside from the three papers presented at the Darwin celebration on Friday evening, forty-four papers were read at the morning and afternoon sessions. A list of these papers with a brief summary of their contents follows:

*The American-British Atlantic Fisheries Question*: THOMAS WILLING BALCH, of Philadelphia.

This controversy, which is more than a century old, will shortly be submitted to The Hague International Court for settlement. As in the case of the Alaska frontier, where Canada's land claims grew greater with the passing of years, so in this fisheries dispute the position of America on the one hand and of Great Britain, Canada and Newfoundland on the other, is admirably summed up in the words with which the Russian plenipotentiary, Count Nesselrode, defined the positions and arguments of Russia and England when they were discussing the Russo-British American frontier: "Thus we wish to conserve and the English companies wish to acquire."

*The Nation and the Waterways:* Professor LEWIS M. HAUPT, of Philadelphia.

A philosophical discussion of the relation of the states and the national government in relation to the waterways of the country, in which it was pointed out that the lack of a proper distinction between local, state and national improvements has led the government to assume jurisdiction over all waterways and has thus retarded the symmetrical development of the trunk lines in connection with their feeders by the inability to systematically exclude all these works at the same time. The remedy must lie in the restriction of the governmental control to the strictly interstate waterways or trunk lines and principal harbors, while the states should charter, as in times past, local corporations to develop their own internal avenues of trade and power, as has been so satisfactorily done in relation to the overland highways of commerce and is still the practise in New York, Illinois, Massachusetts and other states.

*Why America should Reexplore Wilkes Land:*

EDWIN SWIFT BALCH, of Philadelphia.

Lieutenant Charles Wilkes, U.S.N., first announced to the world in 1840 the existence of a great Antarctic continent, along whose shores he sailed for a distance of 1,500 miles. This coast is known as Wilkes Land. It has not been visited again. Sir James Clark Ross, R.N., Sir Clements R. Markham, ex-pres. R.G.S., and Captain Robert F. Scott, R.N., neither of whom has been there, declare emphatically that Wilkes Land does not exist and should be expurgated from the charts. It should, therefore, be looked on as a patriotic duty for America to verify Wilkes's discovery and get a more careful chart of its shores.

Many of the early discoveries in West Antarctica were made by American sealers, by Swain, Palmer, Pendleton, Morrell and Smiley. Now all their discoveries are being verified and enlarged by men of other nations. The same thing will happen with Wilkes's discoveries in East Antarctica, if America will not wake up. An expedition to verify Wilkes's discoveries would cost perhaps \$100,000; and the best way to start it might be by forming an Antarctic committee, composed of representative scientists and explorers, who would take hold of and push this matter.

At the conclusion of the reading of Mr. Balch's paper the society adopted the following resolution, presented by Rear-Admiral Geo. W. Melville, Mr. Henry G. Bryant and Mr. E. S. Balch:

WHEREAS: The United States in former years made many brilliant discoveries in the Antarctic, including the continent of Antarctica by Charles Wilkes, and

WHEREAS: The United States have not taken any part in the recent scientific explorations of the South Polar region; therefore be it

*Resolved*, That the American Philosophical Society requests the cooperation of the scientific and geographical societies of the United States, to urge on the navy of the United States and through the general government, that it do make sufficient appropriations to fit a government vessel to thoroughly explore and survey the coast of Wilkes Land, and other parts of Antarctica.

*The Volcanic Formation of Java:* HENRY G. BRYANT, of Philadelphia.

An account of Mr. Bryant's explorations of the volcanic formations of the island of Java, illustrated by photographs taken by the author.

*Machines and Engineering in the Renaissance and in Classical Antiquity:* Professor CHRISTIAN HÜLSEN, of Rome.

A description of the methods and engines employed in moving great weights and performing other engineering feats that excite our admiration in the works of antiquity. A precursor of the automobile, a "walking chair," was described, that was operated by man power. The illustrations were drawn from contemporary sources, the earlier from monuments and carvings and the later from prints and drawings, and in many cases contemporary descriptions were cited.

*The Brains of Two White Philosophers and of Two Obscure Negroes:* Professor BURT G. WILDER, of Ithaca, N. Y.

The brains of Chauncey Wright and of James Edward Oliver were compared with the brains of two obscure negroes, one a mulatto, the other black. The very unusual gyal simplicity of Wright and the mulatto may have a physiologic significance. The black's brain is comparable with Oliver's and is considerably larger than that of a late prominent politician. These and other paradoxes exemplify the importance of securing a large collection of human brains, especially of educated people, for study and comparison.

In discussion, Professor E. A. Spitzka emphasized the need of more material and stated that the average negro brain is smaller than the average Caucasian.

*Some Conditions Modifying the Interpretation of Human Brain Weight Records:* Dr. H. H. DONALDSON, of Philadelphia.

An account of the brain weight records that have been collected at the Wistar Institute of Anatomy. After the fifteenth year up to the fifty-fifth, the human brain loses slightly in weight and then more rapidly after that period. This slight loss in weight between the fifteenth and fifty-fifth years is attributed to the influence of those diseases which ultimately end in death.

*New Evidences as to the Physical Basis of Heredity:* Professor EDWIN GRANT CONKLIN, of Princeton.

*Some Notes on the Modifications of Color in Plants:* Professor HENRY KRAEMER, of Philadelphia.

The problem of modifying plants in a particular direction is attended with much difficulty, yet we see in nature numerous modifications which are due to the environment, or to external factors, although it is claimed by some modern evolutionists that none of the modifications due to food or to change of locality are permanent.

After reviewing the previous work on the control of color in plants, and enumerating the factors which influence the color in flowers, the author gave the results of his own experiments, which were begun in the autumn of 1904 and have been continued up to the present time. Various soils were experimented with, including an artificial soil, and sand to which a special nutrient was added. The chemicals used to modify the color principles were supplied to the plants in the form of solutions of varying strength, or added to the soil in the solid form, solution gradually taking place.

*Results with Roses.*—Probably the most striking result which the author obtained by the use of chemicals was the production of a red color in the petals of the white rose, Kaiserine. The red pigment occurred in the basal portion of the petals, and was produced in the flowers of plants which were supplied with potassium hydrate, potassium carbonate, calcium hydrate and lead acetate. It should be stated in this connection that the Kaiserine rose tends to yellowish but not to pink or red, and therefore the red color produced in the petals is a new character. Two explanations for its occurrence are suggested: (1) either the added chemical has reacted directly with a compound already present in the petals, or has induced the formation of an entirely new substance; or (2) the color substance formed in other parts of the plants, as in the leaves, has been transported to the petals through the influence of the chemical.

*Results with Hydrangeas.*—Since July, 1907, the author has been experimenting with the red-flowering form of *Hydrangea* (*H. Otaksa*). The following results have been obtained: Blue flowers were produced by plants growing in both sand and garden soil when supplied with the following chemicals: potassium and aluminum sulphate, aluminum sulphate and calcium hydrate. In those plants which were grown in sand and which were supplied with nutrient and potassium carbonate, blue flowers were also produced.

The flowers remained pink or red either when growing in soil or when growing in sand and fed with nutrient and supplied in addition with iron and ammonium sulphate, or lead acetate. In the plants fed with lead acetate the original color was considerably intensified.

In the case of the plants growing in soil and supplied with potassium carbonate there was no change in color, that is, the flowers remained pink, due probably to absorption of the chemical, while as noted above the flowers were changed to blue when growing in sand and supplied with this chemical.

*Comparative Leaf Structure of the New Jersey Strand Plants:* Professor JOHN W. HARSHBERGER, of Philadelphia.

Professor Harshberger classified the floral zones of the New Jersey coast district into four regions or "formations"; (1) the *beach*, (2) the *sand dune*, (3) the *thicket* and (4) the *salt meadow* formations. The character of the flora of each region was dwelt upon, and the leaf structures of the plants adapted to each habitat were described and illustrated. Professor Harshberger believed that studies of this character were necessary to indicate what kinds of plants would have to be grown, if an attempt to reclaim these regions were to be made.

*The Composition of Chrysocolla:* Professor HARRY F. KELLER, of Philadelphia.

Under this head are included various hydrated silicates of copper, which are amorphous and of rather indefinite composition. The color of these varies from green to blue. The author described a well-characterized variety from Chile, which forms enamel-like crusts of turquoise blue color, having the composition of an acid silicate with two molecules of water of crystallization. He expressed the opinion that the variation in color must be ascribed to the differences in the amount of water of crystallization, the blue varieties containing two molecules while the green varieties contain but one. He is also of the opinion that

many of the varieties analyzed contained admixtures of foreign substances.

*The Chemical Work of the U. S. Geological Survey:* FRANK WIGGLESWORTH CLARKE, of Washington.

An account of the admirable chemical work of the Geological Survey Laboratory, of which Professor Clarke is the chief, with a review of the more important results of this work.

*Recent Work on the Physics of the Ether:* PAUL R. HEYL, of Philadelphia.

Considerable interest has been taken of late in the question as to whether the ether is or is not a dispersive medium with regard to light. The work of the speaker, published about a year and a half ago, leads to the conclusion that any dispersion in the ether must be less than one part in 250,000. Since that time others have arrived at the conclusion that there exists a dispersive effect of much smaller magnitude, about one part in a million. There seems to be no doubt of the correctness of their observations, but it is not clear that it is to be attributed to a real dispersive effect in the ether. It is more likely that it is due to tidal phenomena in the atmosphere of the variable stars used as sources of light in the experiments.

*The Effect of Bleaching Powder upon Bacterial Life in Water:* Professor WILLIAM PITT MASON, of Troy, N. Y.

The extraordinary bactericidal effect of free chlorine or of bleaching powders used in minute quantities in drinking waters was described and it was suggested that an emergency plant for the manufacture of chlorine for this purpose should be attached to the municipal water supplies.

*The Detonation of Gun Cotton:* Professor CHARLES E. MUNROE, of Washington.

In the use of gun cotton in mines and torpedoes advantage is taken of the discovery of Mr. E. O. Brown that gun cotton which is completely saturated with water may be detonated by the detonation of dry gun cotton in direct contact with it used as a "priming charge," thus securing a large margin of safety for the naval vessels carrying the explosive. Wet gun cotton containing as high as 35 per cent. of water has been shown to be a more efficient rupturing and shattering explosive than dry gun cotton, but the question of how much water the discs of priming gun cotton may contain to be efficient was the object of the research detailed in this paper. The primer was in all cases fired by the service detonator containing 36 grains of mercuric fulminate. The results

show that detonation of the entire charge was effected in every case in which the primer contained less than 12 per cent. of moisture, and occasionally was complete in cases where the moisture ran as high as 15 per cent. and therefore that such gun cotton primers containing not more than 12 per cent. of moisture, fired by means of a detonator containing 36 grains of mercuric fulminate may be relied upon to detonate wet gun cotton with which they are in contact.

*The Toxodontia:* Dr. W. J. SINCLAIR, of Princeton.

*South American Fossil Catacea:* Dr. FREDERICK W. TRUE, of Washington.

Dr. True remarked that in connection with a revision of the fossil whales and porpoises of the United States he had had occasion to examine various specimens from Patagonia, including some belonging to Princeton University and to the American Museum of Natural History. Among the former, he found a skull of a new genus allied to the large porpoise of the Amazon River, known as the *inia*, but very much larger. The principal specimen from the American Museum of Natural History was a very finely preserved skull of a little-known genus, *Diochotichus*. This skull is remarkable in possessing large openings through the ethmoid plate, indicating that this porpoise, unlike modern forms, probably possessed a brain with an olfactory lobe and well-developed olfactory nerves, and hence, was endowed with a good sense of smell.

The Patagonian fossil cetaceans thus far known are from the provinces of Santa Cruz and Chubut, and are believed to belong to the Tertiary Epoch. At all events, some of the genera are the same as those found in the Miocene formations of Maryland, New Jersey and other Atlantic coast states.

Some of the Patagonian forms belong to families still represented in South America by living species. Others represent families no longer existing. The fossil fauna includes sperm whales, various forms allied to the *inia*, others allied to *Squalodon*, and at least one species of whalebone whales, allied to the finbacks, but no ziphioid, or beaked, whales nor any true dolphins have been found.

*The Destruction of the Fresh-water Fauna of Western Pennsylvania:* Dr. ARNOLD E. ORTMANN, of Pittsburg.

The fresh-water fauna forms part of our natural resources. That it has been injured and partly destroyed by the advance of civilization is well known, but it is not realized how far the destruction has advanced. Since a number of fresh-water creatures are of economical value

(fishes, mussels), and since all creatures belonging to the ecological community of the fresh-water are mutually dependent upon each other, it is very desirable that the causes which lead to the destruction of fresh-water life should be removed.

These causes are: direct extermination by man; pollution of the streams; and river "improvements," as, for instance, the building of dams. The pollution of the water is the most important cause, and, in western Pennsylvania, it is chiefly the coal mining and the oil industries which have contributed to the deterioration and destruction of the fresh-water fauna.

The extent to which this contamination of the waters has been carried in western Pennsylvania was clearly laid down on a map.

*The Stratigraphic Position of the Oolitic Iron-ore at Bloomsburg, Pa.:* GILBERT VAN INGEN, of Princeton.

A study of the so-called "Clinton fossil iron ores" in the vicinity of Bloomsburg, Pa., shows that these oolitic areas are above the Shawangunk grit and conglomerate which is Lower Salina in age, and that they are certainly above the Lower Salina. They contain an extensive fauna and the paleontological evidence points to a Salina age, at least post-Clinton and post-Niagara.

*A Mechanical Device for the Tabulation of the Sums of Numerous Variable Functions:* Professor ERNEST W. BROWN, of New Haven.

*On Certain Generalizations of the Problem of Three Bodies:* President EDGAR ODELL LOVETT, of Houston, Texas.

*Penrose's Graphical Method of Orbit Computation:* Mr. ERIC DOOLITTLE, of Philadelphia.

The method shows how, when the exact position of a moving comet or planet among the stars has been observed on three or more nights, the path of the body can be determined and also the position which the body will occupy as viewed from the earth at any desired time. But little computation and no knowledge of higher mathematics is necessary in applying the method which well illustrates the principles of more intricate methods and also enables the position of the body in the sky to be predicted with sufficient accuracy to render it easily found in a telescope at any time.

*On the Remarkable Changes in the Tail of Comet C. 1908 (Morehouse), and on a Theory to Account for these Changes:* Professor E. E. BARNARD, of Yerkes Observatory, Williams Bay, Wis.

Professor Barnard exhibited a remarkable series of photographs made with the photographic telescopes at the observatory, showing changes that occurred in the tail of this comet which appear to indicate resistance to the passage of the body through space. In discussion of the paper it was suggested that this resistance might arise from clouds of meteoric dust, too fine to be visibly appreciable, but which might still be dense enough to offer a resistance that would account for the changes in the form of the tail of the comet that were shown by the photographs.

*The Past History of the Earth as Inferred from the Mode of Formation of the Solar System:* Dr. T. J. J. SEE, of U. S. Naval Observatory, Mare Island, Cal.

*Linear Resistance between Two Parallel Conducting Cylinders:* Professor A. E. KENNELLY, Harvard University, Cambridge, Mass.

The equipotential surfaces perpendicular to the lines of flow between two equally and oppositely charged parallel wires of very small radii are cylinders whose axes are in the plane of and parallel to the charged wires. If any of these cylinders were made conducting and the charge on the wire within transferred to it, the lines of flow and equipotential surfaces on the outside would remain the same. Hence the resistance between any two such cylinders can be expressed in terms of their radii and the distance between their centers. The equivalent linear resistance between two equal cylinders or of one cylinder and the medium plane may be simply expressed as a product of its circumference and a function of its radii and the distance of its center from the plane.

*Vacuum Effects in Electrical Discharge around a Right Angle in a Wire:* Professor FRANCIS E. NIPHER, of St. Louis.

*On the Ruling of Diffraction Gratings:* Professor ALBERT A. MICHELSON, University of Chicago, Ill.

The paper gave a brief statement of the development of the grating, mentioning the ingenious wire grating of Fraunhofer, the improvements of Rutherford, and the magnificent gratings of Rowland. These were sufficient in their day, but problems connected with more recent researches like the Zeeman effect and phenomena of that nature demanded a much greater resolving power. In this connection it was pointed out that the important fact was not so much the number of rulings per inch as the total number of rulings, and that this greater number of rulings necessi-

tated a correspondingly greater degree of regularity—an accumulated error of one ruling in the entire number being fatal.

The ruling engine now set up in the Ryerson Laboratory gives this necessary increase in perfection of ruling, so that the spectra are almost free from ghosts and those of the higher orders can be used. The resolving power is proportional to the product of the total number of rulings into the order. A photograph of a part of the Hg spectrum was shown, in which the distance between two of the lines was only one two-thousandths of the distance between the Na D lines, and it was evident that lines separated by only one half of this distance would be distinctly resolved.

This ruling engine is the result of seven years' work. The large ten-inch gratings are ruled on metal to save the cutting edge of the diamond, and weigh about thirty pounds. The greater part of this weight is supported by a float in mercury, only a small part pressing upon the ways. It is moved along the ways by a screw with a large head working by fine teeth in an automatically actuated worm. This screw was made as perfect as possible by long, careful grinding and the remaining errors which are of the order of the one millionth part of an inch are automatically compensated for by a slight tangential motion of the worm. This motion is a function of the position of the nut, determined empirically.

*On an Adjustment for a Plane Grating Similar to Rowland's for the Concave Grating:* Professor CARL BARUS, assisted by M. Barus, of Providence.

By using two slides, one symmetrically normal to the other, and observing on both sides of the point of intersection, it is shown that many of the errors are eliminated by the symmetrical adjustments in question. The slide carrying the grating may be provided with a focusing lens in front, or again behind it, if the means are at hand for actuating the slit, which is not sharply in focus throughout the spectrum at a given time, on the plane of the eye piece carried by the second slide. It is thus best to use both lenses conjointly, the latter as a collimator and the former as an objective of the telescope in connection with the eye-piece. The authors show that a centimeter scale parallel to the eye piece slide, with a vernier reading to millimeters, is sufficient to measure the wave lengths of light to few Angström units, while the wave lengths are throughout strictly proportional to the displace-

ments along the scale. The errors of the three available methods and their counterparts are discussed in detail.

*The Electrometer Method of Standardizing the Coronas of Cloudy Condensation:* Professor CARL BARUS, of Providence.

The author makes use of Thomson's method of measuring the charge of an electron in terms of the velocity of the ions and their number. The latter, however, are determined from the angular diameter of the coronas of cloudy condensation, produced in a cylindrical fog chamber under given conditions of rapid exhaustion. By providing the chamber with a charged axial aluminum tube closed within, and charged or not with sealed tubelets of radium acting through the aluminum walls in virtue of its beta and gamma rays, the fog chamber becomes an electrical condenser with a variable ionization. The electrical current passing from core to the shell of the cylindrical condenser may therefore be simultaneously measured by a sensitive electrometer. If it be assumed that negative ions only are caught in the fog chamber used and if the author's earlier and independent results are employed for stating the nucleation value of the coronas, the following data are typical for the enormous ionizations produced:

Total number of ions per cub. cm. = 1,700,000, 385,000, 135,000.

Corresponding value of ten thousand million times the electrical charge = 4.4, 3.6, 3.9 electrostatic units.

The author discusses the results critically and shows that the displacement of ions during exhaustion is the most serious source of discrepancy. Again that in a house in which a continuous lighting circuit terminates, it is absolutely essential to determine both the positive and negative current in the condenser separately, as they are liable to be widely different. On the other hand, the effect of gamma rays on the outside of the fog chamber and of conduction currents is almost negligible for a well-installed apparatus.

*The Electrometric Measurement of the Voltair Potential Difference between Two Conductors of a Condenser containing a Highly Ionized Medium:* Professor CARL BARUS, of Providence.  
*Solar Activity and Terrestrial Magnetic Disturbances:* Dr. L. A. BAUER, of Washington.

This paper deals with the connections between the various manifestations of solar activity, *e. g.*, sun-spots, and the so-called magnetic storms which at times affect compass needles simultaneously all over the earth by several degrees and even cause

serious interruption in telegraph and cable lines, and are usually accompanied by fine auroral displays. One of the most severe of these magnetic storms was that of October 30–November 1, 1903, which was violent enough to derange the mariner's compass at certain places by as much as  $3^{\circ}$  and even was said to have caused a temporary suspension of the electric car lines in Zürich, Switzerland. The effect from this particular storm lasted for fully two months after its apparent subsidence, the earth's magnetic condition being *below* normal until towards the close of the year (1903).

Renewed interest has been shown by the recent discoveries of Professor Hale, director of the Carnegie Solar Observatory at Mount Wilson, Cal., viz., that sun-spots are centers of violent cyclones and that they are accompanied by powerful magnetic fields. But however intensely magnetic these whirling cyclones may be, a simple calculation shows that they are far too distant to appreciably affect our most sensitive magnetic instruments.

Yet the various curves exhibited show indisputably that some relation exists between solar activity, as evidenced, for example, by sun-spots, calcium flocculi, solar eruptions, prominences, etc., and the earth's magnetic fluctuations. The variations in the solar and the terrestrial magnetic phenomena follow each other closely. One of the most important of the conclusions drawn is, that *an increase in sun-spot activity is accompanied by a decrease in the earth's magnetization, or that the magnetization superposed on the earth's magnetic field during solar outbreaks is opposite to that of the earth's own field.*

It appears questionable whether the earth's magnetism ever settles down precisely to its former condition after the occurrence of a magnetic storm.

The facts are not yet sufficient to draw a definite conclusion whether solar activity and magnetic storms stand to each other as cause and effect or whether they are both effects of the same cause. The indications are, that during a period of intense solar activity, in some as yet unknown manner, considerable fluctuations are caused to take place in the electric field that we know from various facts exists in the regions above us. These varying electric currents in turn affect the magnetic needles on the earth's surface.

*On the Hevelian Halo:* Professor CHARLES S. HASTINGS, of New Haven, Conn.

The paper reviewed the various kinds of halos that have been described and the explanations that have been offered in regard to their origin. It

had been assumed by writers on the subject that the snow crystals, which are in the form of plates or prisms, would fall with the plate or prism presenting the least resistance to the air. Thus, according to this idea, the hexagonal plates would fall edge on and the prism end on. This was shown to be incorrect and the contrary was the case, the plates and prisms could fall through the air with their longer dimensions horizontal. The plates would assume a horizontal position as well as the prisms. The halo was then caused by total internal reflection from the plates or prisms and not by surface reflection. Assuming these general positions for the long or short prisms (or plates) and total internal reflection the various types of halo that have been described could be explained, with the exception of the Hevelian halo. To explain this on the basis of total internal reflection it was necessary to assume pyramidal planes in the crystal of such an angle as to produce the 90 degree halo of this rare type.

*The Effect of Temperature on the Absorption of Certain Solutions:* Professor HARRY C. JONES, of Baltimore.

An account of experiments on the absorption spectra of certain solutions which Dr. Jones is carrying on under the auspices of the Carnegie Institution of Washington, D. C. Increase of temperature of the solution was found to alter the absorption spectra in the same way that they are changed by concentration of the solution.

*The Specific Chemo-therapy of the Protozoal Diseases:* Dr. SIMON FLEXNER, of the Rockefeller Institute for Medical Research, New York.

*The Unsuspected Presence of Habit-forming Agents in Beverages and Medicines:* Dr. LYMAN F. KEBLER, of Washington.

The paper considers the increased use of various habit-forming drugs. Attention is called to the fact that a large number of soft drinks contain not only a considerable amount of caffeine, but in many instances small quantities of cocaine. The presence of cocaine has also been found in a considerable number of agents intended for the treatment of the tobacco habit. The presence of the same pernicious drug has been revealed in medicine used in the treatment of hay fever, asthma and for relieving pain resulting from dentition in infancy. The presence of morphine, opium, chloral hydrate, heroin and codein, singly or combined, has also been found in many other medicines, particularly those intended for the treatment of epilepsy, rheumatism, asthma, gastric troubles and ailments of infancy and childhood.



## SYMPOSIUM ON EARTHQUAKES

*Introduction, Classification, Discussion of Volcanic Earthquakes, Description, with Illustrations, of the Charleston, S. C., and Kingston, Jamaica, Disasters:* Professor EDMUND O. HOVEY, New York.

*The Present Status and the Outlook of Seismic Geology:* Professor WILLIAM H. HOBBS, of Ann Arbor, Mich.

*Conditions Leading to Tectonic Earthquakes—Instruments used in the Study of Earthquakes—Suggestions for a National Seismological Bureau:* Professor HARRY F. REID, of Baltimore.

Professor Hovey's paper served as an introduction to the subject. The ideas in regard to the cause of earthquakes were considered, especial attention being given to a discussion of volcanic earthquakes. Professor Hovey described the Charleston and Kingston earthquakes and illustrated his description by lantern slides. At the conclusion of his paper he exhibited a series of views of the Messina earthquake of December, 1908.

Professor W. H. Hobbs spoke of the manner in which the subject of seismology had been retarded by the publications of Robert Mallet, who advocated the idea that the shock originates at some point underground called the seismic focus or centrum, and from which center elastic waves are propagated in all directions. Professor Hobbs pointed out the fact that the "centrum" as determined by the method of Mallet was at best a line and practically had no existence. He explained the production of earthquakes by the shifting of segments of the crust along already existing fissures due to geotectonic movements, and insisted upon the tectonic origin of earthquakes. Volcanic activity and earthquake activity may be associated, as volcanoes are located along lines of fissure in the crust. Release of strain by shifting of the crust blocks, accompanied by earthquakes, as has been going on in the earthquake regions surrounding the Pacific Ocean in the last few years, probably produces in such a region an establishment of approximate equilibrium so that earthquakes may not be so severe for some time. The probability of earthquakes occurring in a given region may be tentatively predicted by a study of such crustal adjustment, but such predictions must be considered as tentative only. The upward or downward movement of the surface during earthquakes may be considerable, producing raised beaches, as has recently occurred in the Alaskan Islands. Along some coast lines the

evidence of such movement is to be seen in the raising of sea caves, and also the undercut portions of sea-cliffs, above the water level. As these movements involve many feet of elevation during an earthquake, perhaps the ideas of Lyell on the rate of changes of level of the land and sea may have to be modified.

Professor Harry Fielding Reid considered three phases of the subject: (a) conditions leading to tectonic earthquakes, (b) instruments used in the study of earthquakes, (c) suggestions for a national seismological bureau.

(a) The rocks have the properties of elastic substances and can only break after they have been deformed by the action of external forces. When they are strained beyond their strength a break occurs and the rocks return to an unstrained position, but it is only in the general neighborhood of the rupture that any distinct displacement takes place at the time of the earthquake.

(b) Earlier investigators attempted to obtain a "steady point"; that is, a point which would remain at rest when the earth vibrated under the earthquake disturbances. This, however, is impracticable. All earthquake instruments must have a proper period of vibration and when the disturbance affects them the resulting record is a combination of the movement of the earth and the movement of the instrument. When the period of vibration approaches that of the instrument, the latter has a very large swing and therefore the records unduly magnify special vibrations. This can be avoided by introducing strong damping. The different forms of instruments were briefly noticed.

(c) The work of a national bureau would be very varied. It would require the collection of data regarding all felt earthquakes, and a geological examination, in special cases, of the regions where earthquakes occur. The instrumental records from the whole country should also be collected and studied to throw light on the nature of the earth's interior, and to discover the centers of earthquake disturbances in the surrounding oceans. This would require the general cooperation of many departments of the government and could probably be best undertaken by the Smithsonian Institution.

At the conclusion of the discussion following the symposium Professor Hobbs presented the following resolutions, which were unanimously adopted:

WHEREAS: Earthquakes have been the cause of

great loss of life and property within the territory of the United States and its possessions, as well as other countries; and

WHEREAS: It is only through the scientific investigation of the phenomena that there is hope of discovering the laws which govern them, so as to predict their occurrences and to reduce the danger to life and property; and

WHEREAS: Such investigations can be successfully conducted only with the support of the general government, be it therefore

*Resolved*, That this society urge upon Congress the establishment of a national bureau of seismology, and suggest that this bureau be organized under the Smithsonian Institution with the active cooperation of the other scientific departments of the government, and that this bureau be charged with the following duties: (a) the collection of seismological data, (b) the establishment of observing stations, (c) the organization of an expeditionary corps for the investigation of special earthquakes and volcanic eruptions in any part of the world, (d) the study and investigation of special earthquake regions within the national domain, and

*Resolved*, That copies of these resolutions be transmitted to the president, the speaker of the house of representatives, to the president of the senate and to the secretary of the Smithsonian Institution.

*The Evolution of the City of Rome from its Origin to the Gallic Catastrophe*: Professor JESSE B. CARTER, of Rome, Italy.

An attempt to sketch in its outlines the development of the city of Rome from its origin to the Gallic catastrophe. The original people lived in little communities upon the hilltops, each community surrounded by a circular wall or stockade. The geological character of the campagna and its topography produced a number of elevations admirably adapted for such settlements. All of these little hilltop towns must have been very similar in population and customs and no one was probably a leader among them. Their consolidation into a city is assigned to the influence of an invasion by the Etruscans who conquered these hill towns, and enclosed them along with their intervening valleys with one wall. Some villages remained without the wall, as suburbs to be afterwards incorporated in the city; such were the Aventine region and the Campus Martius. The city had then outgrown its original dimensions and was no longer all within walls, which accounts for the ease with which it was captured by

the Gauls in 390 B.C. With the capture of the city by the Gauls Rome enters upon her period of inviolability for almost eight hundred years and the thought suggests itself irresistibly that the reputation for inviolability thus gained may have been a large factor in preserving her inviolate. Even in their early days the city began to be "that so holy spot, this very Rome."

*On the Extent and Number of the Indo-European Peoples*: Professor MAURICE BLOOMFIELD, of Baltimore.

*The Burning Bush and the Origin of Judaism*: Professor PAUL HAUPT, of Baltimore.

The Israelites probably never saw Egypt. The so-called Israelites who were in Egypt were the descendants of Esau, the Edomites. The burning bush was explained as the shrubbery on the heights of a volcano, lighted up at night by the glow of the incandescent lava. The story of the pillar of cloud by day and pillar of fire by night was not that it hung over the tabernacle but over Mount Sinai, the cloud of steam from the active volcano was the "pillar of cloud by day and the pillar of fire by night." The myths in regard to the destruction of Jericho and of Sodom and Gomorrah were attributed to the effect of earthquakes.

*Magic and Religion*: Professor EDWARD W. HOPKINS, of New Haven.

*Milton's Confession of Faith: The Identity of Religious Belief between Milton and George Fox*: ALDEN SAMPSON, of Haverford, Pa.

*J. J. Rousseau, a Precursor of Modern Pragmatism*: Professor ALBERT SCHNIZ, of Bryn Mawr, Pa.

At the Darwin commemorative meeting, after the presentation of the three addresses attention was called to the fact that there were two members of the American Philosophical Society still living in England who were friends of Charles Darwin—Sir Joseph Dalton Hooker and Dr. Alfred Russel Wallace—and on motion it was unanimously resolved that the society should cable to them its greetings and congratulations on the general acceptance of the views in the elaboration and promulgation of which they had taken such an effective part.

Early in the day a telegram was sent to Vice-president Simon Newcomb conveying to him the society's good wishes and greeting and their regret that he could not be present at the meeting.

The meeting was largely attended by members from various parts of the country and was regarded as most successful both from the point of

view of the quality of the papers read and the number and broadly representative character of the members who took part in it.

The sessions closed with a dinner at the Bellevue-Stratford, on Saturday evening, April 24, at which about one hundred members were present and at which the speakers were: President Patton, of Princeton; the British Ambassador, Mr. Bryce; President Pritchett, of the Carnegie Foundation; President-elect Lowell, of Harvard, and President Keen, of the American Philosophical Society.

The annual election of members held at the executive session on Saturday, April 24, resulted in the election of the following candidates:

*Residents of the United States.*—Louis A. Bauer, Ph.D. (Berlin), Washington, D. C.; Marston Taylor Bogert, New York; Hermon Carey Bumpus, Ph.D., New York City; Alexis Carrel, M.D., New York City; Edwin Brant Frost, Williams Bay, Wis.; Robert Almer Harper, Ph.D., Madison, Wis.; William Herbert Hobbs, Ph.D., Ann Arbor, Mich.; A. V. Williams Jackson, Ph.D., LL.D., Yonkers, N. Y.; John Frederick Lewis, Philadelphia; Abbott Lawrence Lowell, Boston, Mass.; William Romaine Newbold, Ph.D., Philadelphia; Charles Bingham Penrose, M.D., Ph.D., Philadelphia; William Howard Taft, Washington; Charles Richard Van Hise, M.S., LL.D., Madison, Wis.; Victor Clarence Vaughan, M.D., Sc.D., LL.D., Ann Arbor, Mich.

*Foreign Residents.*—Francis Darwin, M.A., F.R.S., Cambridge, Eng.; Hermann Diels, Ph.D., Berlin; Emil Fischer, Ph.D., M.D., Berlin; Friedrich Kohlrausch, Ph.D., Marburg; Wilhelm F. Pfeffer, Ph.D., Leipzig.

#### SOCIETIES AND ACADEMIES

##### THE ACADEMY OF SCIENCE OF ST. LOUIS

On the evening of Monday, March 1, the regular meeting of the Academy of Science of St. Louis was held at the Academy Building, the feature of the program being a paper, read by Mr. Julius Hurter. The subject of the discourse, which had been compiled by Mr. Hurter and Mr. John K. Strecker, Jr., was "The Amphibians and Reptiles of Arkansas."

After stating that up to the present time definite records are obtainable from only 15 of the 75 counties of Arkansas, Mr. Hurter recorded the facts that 100 species of reptiles and amphibians have been reported from Arkansas, and 90 from Missouri. Thirteen of the Arkansas species are not known to occur in Missouri, and nineteen are not found in eastern Texas. Most of the species

are eastern and southeastern forms which find their western limit in Arkansas and the eastern half of Louisiana. Another interesting fact brought out was this—that of the 71 species occurring in both Arkansas and the eastern half of Texas, 63 are also found in the state of Missouri. Mr. Hurter showed numerous specimens in illustration of his paper, and also the blind salamanders of the world: *Proteus anguinus* (European blind salamander), *Typhlotriton spelæus* (Missouri) and *Typhlomolge rathbuni* (Texas).

At this meeting, on proper motion, duly seconded and unanimously carried, the following memorial was adopted as expressing the views of the academy; and copies were ordered sent to the speaker of the house of representatives, the president of the senate, and the gentlemen who represent Missouri in both branches of the present Congress:

"The Academy of Science of Saint Louis, an organization equally interested in the preservation and the proper and consistent utilization of the gifts of nature, respectfully urges on the Congress of the United States the desirability of promptly passing the House Joint Resolution now under consideration as a means of continuing the provisions of the Burton Bill, limiting the diversion of water from Niagara Falls, until equally effective but more permanent protection of the Falls shall be secured by adequate legislative or executive action."

The program of the meeting of the Academy of Science of St. Louis which occurred on March 15 was a paper by Mr. Otto Widmann on "The Birds of the Missouri Botanical Garden." In twenty visits to the garden during the summer of 1908, Mr. Widmann noted forty species of birds breeding there, and six species which were more or less regular visitors from near-by breeding grounds. And, besides these, there were scores of transient visitants during the migratory seasons. The breeders are the bob-white, mourning-dove, screech owl, yellow-billed cuckoo, black-billed cuckoo, red-headed woodpecker, northern flicker, chimney swift, kingbird, great crested flycatcher, wood pewee, Traill's flycatcher, blue jay, crow, cowbird, red-winged blackbird, meadow lark, orchard oriole, Baltimore oriole, bronzed grackle, goldfinch, English sparrow, English tree sparrow, chipping sparrow, song sparrow, towhee, cardinal, rose-breasted grosbeak, indigo bunting, warbling vireo, Bell's vireo, yellow warbler, yellow-throat, yellow-breasted chat, mockingbird, catbird, brown thrasher, house wren, wood thrush and robin.